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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Appellant:		§		
	Guest et al.	§		
Filed:	August 3, 2000	§	Art Unit:	2877
Serial No.:	09/631,509	§	Examiner:	V. Barth
For:	SYSTEM AND METHOD FOR INSPECTING BUMPED WAFERS	§	Docket No.:	013377-0058 (B64909)

APPEAL BRIEF

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TABLE OF CONTENTS

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO: MAIL STOP APPEAL BRIEF - PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VIRGINIA 22313-1450, ON THE DATE INDICATED BELOW

BY: Kelly Kueze DATE: 7/25/2003

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re:	Patent Application of Guest et al.	: Group Art Unit: 2877
Appln. No.:	09/631,509	: Examiner: V. Barth
Filed:	August 3, 2000	:
For:	SYSTEM AND METHOD FOR INSPECTING BUMPED WAFERS	: Attorney Docket : No. 013377-0058 (B64909)

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPELLANT'S BRIEF (37 C.F.R. § 1.192)

This brief is in furtherance of the Notice of Appeal, filed in this case on May 23, 2003 and received on May 27, 2003.

The fees required under § 1.17 are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate. (37 C.F.R. § 1.192(a)).

This brief contains these items under the following headings, and in the order set forth below (37 C.F.R. § 1.192(c)).

I. REAL PARTY OF INTEREST

II. RELATED APPEALS AND INTERFERENCES

III. STATUS OF CLAIMS

IV. STATUS OF AMENDMENTS

V. SUMMARY OF INVENTION

VI. ISSUES

VII. GROUPING OF CLAIMS

VIII. ARGUMENTS

ARGUMENT: VIIID – REJECTIONS UNDER 35 U.S.C. 103

IX. APPENDIX OF CLAIMS INVOLVED IN THE APPEAL

X. OTHER MATERIAL THAT APPELLANT CONSIDERS NECESSARY ORDESIRABLE

The final page of this brief bears the practitioner's signature.

I. REAL PARTY OF INTEREST (37 C.F.R. § 1.192(c)(1))

The real party in interest in this appeal is Semiconductor Technologies and Instruments, Inc.

II. RELATED APPEALS AND INTERFERENCES (37 C.F.R. § 1.192(c)(2))

There are no appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS (37 C.F.R. § 1.192(c)(3))

The status of the claims in this application are:

A. TOTAL NUMBER OF CLAIMS IN APPLICATION

Claims in the application are: 21 claims. (Claims 1-21)

Claims currently pending in the application: 21 pending claims

B. STATUS OF ALL THE CLAIMS

1. Claims cancelled: NONE
2. Claims withdrawn from consideration but not cancelled: NONE
3. Claims pending: 1-21
4. Claims allowed: NONE
5. Claims rejected: 1-21

C. CLAIMS ON APPEAL

The claims on appeal are: 1-21

IV. STATUS OF AMENDMENTS (37 C.F.R. § 1.192(c)(4))

The claims presently pending are those submitted December 4, 2002, in response to the non-final Office Action dated September 4, 2002 (paper no. 4).

V. SUMMARY OF THE INVENTION (37 C.F.R. § 1.192(c)(5))

The following summary is provided without any intention to limit the scope of the claims. The subject matter of claims 1-21 is summarized below.

Claim 1 includes a system for inspecting a component that comprises a two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data; and a three dimensional inspection system coupled to the two dimensional inspection system, the three dimensional inspection system receiving the feature coordinate data and generating inspection control data.

Claim 9 includes a method for inspecting a component that comprises processing two dimensional image data of the component to determine location data for each of a plurality of features on the component. Control data for a three dimensional inspection of the component is determined from the location data for each of the plurality of features. A three dimensional inspection of the component is performed using the control data.

Claim 16 includes a method for processing image data to locate one or more features that comprises receiving first image data of a component prior to installation of one or more features. Second image data of the component is received after the installation of the one or more features. The first image data and the second image data are then compared to generate difference data. The location of each of the one or more features is then determined from the difference data.

Narrower embodiments of the invention are described below.

Claim 2 depends from claim 1 and includes a component inspection controller coupled to the three dimensional inspection system, the component inspection controller receiving the inspection control data and controlling the location of the component based upon the inspection control data.

Claim 3 depends from claim 1 and further comprises a reference image system storing

one or more reference images; a test image system storing test image data; and a comparator system coupled to the reference image system and the test image system, the comparator system generating difference data from the reference image data and the test image data.

Claim 4 depends from claim 3 and includes that the reference image system comprises a die base reference image system storing image data of a die prior to installation of bumps.

Claim 5 depends from claim 3 and includes that the reference image system comprises a test die reference image system storing image data of a test die with installed bumps.

Claim 6 depends from claim 1 and includes that the two dimensional inspection system further comprises a feature location tracking system storing the feature location data and providing the feature location data to the three dimensional inspection system after all features of the component are located.

Claim 7 depends from claim 1 and includes the three dimensional inspection system further comprises a laser placement system that determines the location of a laser inspection track on the component from the feature location data.

Claim 8 depends from claim 1 and includes the three dimensional inspection system further comprises a three dimensional image data analysis system that receives laser image data and determines three dimensional feature location data from the laser image data.

Claim 10 depends from claim 9 and includes that processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises comparing test image data to die base reference image data to generate difference data, and analyzing the difference data to determine the location of each of the plurality of features.

Claim 11 depends from claim 9 and includes that processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises comparing test image data to test die reference image data to generate difference data, and analyzing the difference data to determine the location of each of the plurality of features.

Claim 12 depends from claim 9 and includes that determining the control data for the three dimensional inspection of the component from the location data for each of the plurality of features comprises determining placement sequence data for a laser inspection track such that the laser inspection track is placed on each of the plurality of features at least once, and determining

component movement control data from the placement sequence data.

Claim 13 depends from 9 and includes that performing the three dimensional inspection of the component using the control data comprises obtaining image data from a laser inspection track on the component, and analyzing the image data to determine the location of one or more features.

Claim 14 depends from claim 13 and further comprises moving the component until the image data has been obtained for each of the features on the component.

Claim 15 depends from claim 13 and further comprises generating error data if the location of any of the one or more features is outside of a predetermined location range.

Claim 17 depends from claim 16 and includes that receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a die prior to the installation of one or more contact bumps.

Claim 18 depends from claim 16 and includes that receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a representative component prior to the installation of the one or more features.

Claim 19 depends from claim 16 and further includes determining the placement of a three dimensional inspection component based upon the location of each of the one or more features.

Claim 20 depends from claim 19 and includes that determining the placement of the three dimensional inspection component comprises determining the location of a laser track.

Claim 21 depends from claim 16 and includes that determining the location of each of the one or more features from the difference data comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features.

VI. ISSUES ((37 C.F.R. § 1.192(c)(6))

Whether claims 1-15, 19, and 20 are unpatentable under 35 USC § 103(a) over Michael in view of Nichani.

Whether claims 16-18 and 21 are unpatentable under 35 U.S.C. § 103(a) over Nichani.

Michael – U.S. Patent No. 6,173,070

Nichani – U.S. Patent No. 6,298,149

VII. GROUPING OF CLAIMS ((37 C.F.R. § 1.192(c)(6))

The following claim groupings are considered as standing or falling separately:

(a) Claims 1-15.

(b) Claims 4, 10 and 16-21.

The reasons for separate patentability are set forth below.

VIII. ARGUMENTS ((37 C.F.R. § 1.192(c)(6))
ARGUMENT: VIIID – REJECTIONS UNDER 35 U.S.C. 103 (37 C.F.R. § 1.192(c)(8)(iv))

1. <u>Background to Presently Claimed Invention</u>

In one exemplary embodiment, the presently claimed invention provides a system for inspecting a component that includes a two dimensional inspection system that locates a plurality of features on the component and generates feature coordinate data. A three dimensional inspection system coupled to the two dimensional inspection system receives the feature coordinate data and generates inspection control data.

In another exemplary embodiment, the invention includes a method for inspecting a component that comprises processing two dimensional image data of the component to determine location data for each of a plurality of features on the component. Control data for a three dimensional inspection of the component is determined from the location data for each of the plurality of features. A three dimensional inspection of the component is performed using the control data.

In another exemplary embodiment, the invention includes a method for processing image data to locate one or more features where first image data of a component is received prior to installation of one or more features. Second image data of the component is then received after the installation of the one or more features, and the first image data and the second image data are then compared to generate difference data. The location of each of the one or more features is then determined from the difference data.

2. <u>Michael</u>

Michael discloses a system for analyzing three dimensional image data of scanned surfaces to locate items of interest, such as solder balls. A three dimensional model is first made of the object of interest, and three dimensional captured image data is then processed to locate objects matching the three dimensional model. Col. 2, line 59 through col. 3, line 5. Michael essentially discloses the use of golden template comparison of a three dimensional golden template with three dimensional captured image data.

3. Nichani

Nichani discloses subtracting a first set of two dimensional image data that is generated when a component is illuminated so as to cause potential defects to appear as dark features against a light background with a second set of two dimensional image data that is generated when a component is illuminated so as to cause potential defects to appear as light features against a dark background, so as to generate a difference image in which potential defects are readily distinguished from areas having no defects. Col. 3, lines 33-44. Nichani discloses golden template comparison in the background of the invention, and notes at col. 2, lines 52-56 that the need to register the captured image to the golden template image is a drawback that the invention of Nichani overcomes (although it does note at col. 4, lines 4-5 that registration can be used with the disclosed invention).

4. Patentability of claims 1 through 15, 19 and 20

Performing a three dimensional inspection of a component is a time-consuming process. Prior art processes require three dimensional image data of the entire component to be generated prior to performing the inspection, which includes generating such data for areas that are not of interest. Although analysis of the image data for such areas might not be performed using prior art processes such as those disclosed in Michael, they must nevertheless be obtained, which takes time and decreases the speed at which a component can be inspected.

Claims 1 through 15, 19 and 20 allow areas of interest to be identified using two dimensional inspection processes before generating three dimensional data in selected areas, thus greatly reducing the time required for performing a three dimensional inspection. The Examiner's construction of claims 1 through 15, 19 and 20 would require three dimensional data to be generated for the entire component, and thus reads elements out of the claims. The Examiner's construction would also eliminate the use of feature location data obtained from the two dimensional inspection process to control the three dimensional inspection, which also reads elements out of the claims. Federal Circuit precedent prohibits construing claims in a manner that reads elements out of the claim. *Texas Instruments v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1171 (Fed. Cir. 1993). Claim construction is reviewed *de novo* by the Board of Patent Appeals and Interferences. Further, it is axiomatic that "that which anticipates if earlier infringes

if later." Thus, it needs to be determined *de novo* whether Michael in view of Nichani would infringe the proper construction of claims 1 through 15, 19 and 20.

Claim 1 includes a "system for inspecting a component comprising: a two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data; and a three dimensional inspection system coupled to the two dimensional inspection system, the three dimensional inspection system receiving the feature coordinate data and generating inspection control data." Thus, it must be determined *de novo* whether any combination of Michael in view of Nichani would infringe claim 1 as properly construed.

Michael pertains only to performing three dimensional inspection using three dimensional image data that is generated of the entire component. The component is inspected using the three dimensional inspection system without being controlled based on the location of features on the component. Thus, even if Nichani provides the "two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data," the element of using the feature coordinate data to control the three dimensional inspection is missing entirely from the combination of Michael in view of Nichani. As such, construing the claims in a manner that allows Michael in view of Nichani to anticipate the claims under 35 U.S.C. 103 reads this element out of the claims.

Furthermore, the Examiner states that "Michael further discloses that 2D coordinate data may be generated by golden template comparison (GTC) (col. 10, line 35) and combined with 3D data." Paper no. 4, pages 3-4. However, column 10, line 35 of Michael only states that "as another example, further processing including Golden Template Comparison can be performed." As previously discussed, Michael essentially discloses a three dimensional golden template comparison inspection process. No mention is made of generating two dimensional data at all in Michael, much less prior to generating three dimensional data, and of using that two dimensional data to generate inspection control data based on feature location data. For example, Figure 2 of Michael shows "3D captured image data" at block 26, but nowhere shows generation of two dimensional data. Since the purpose behind performing a two dimensional inspection ***prior to*** performing the three dimensional inspection is to reduce the time required to inspect the component by limiting the areas from which three dimensional data must be gathered, it is clear that Michael would fail to infringe this process, as it discloses obtaining and analyzing three dimensional image data for the entire component, and not generating inspection control data

based on feature coordinate data.

Nichani also fails to disclose or suggest using feature coordinate data to control the two dimensional inspection of Nichani – as Nichani discusses at col. 2, lines 52-56, one of the limitations of golden template comparison is "registration" – the lining up of the image under inspection with the template image. Nichani does disclose that registration can be performed at column 6, lines 35-43, in an optional procedure that can be used if the lead frame or camera is moved between image acquisitions. However, performing registration between a golden template and a test image is not a "two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data," much less a use of that feature coordinate data to generate inspection control data.

Since Michael discloses generating three dimensional data of the entire surface of a component, and since neither Michael nor Nichani disclose generating feature coordinate data or using feature coordinate data to generate inspection control data, it is impossible to combine Michael and Nichani in any manner to provide a three dimensional inspection system receiving the feature coordinate data from a two dimensional inspection system and generating inspection control data. The examiner construes "inspection control data" to be that disclosed at Michael col. 4, line 33, which states that the "inspection device 20 can be positioned for example by a robotic manipulator arm 22, which picks up the inspection device 20 from a surface 25." However, Figure 1 of Michael shows a robotic manipulator arm 22 with a predetermined location with respect to image acquisition device 24. Thus, the three dimensional inspection system of Michael does not receive feature coordinate and generate inspection control data – instead, the inspection control data is predetermined based upon a known location of a component that is picked up by a robotic manipulator arm 22 and moved to a predetermined location relative to image acquisition device 24, which then generates three dimensional data of the entire component. In order to combine Michael with Nichani to produce a system that would infringe claim 1, it would be necessary to add functionality to the systems of Michael and Nichani to generate feature coordinate data from the two dimensional inspection data, and to further add receiving the feature coordinate data to the three dimensional inspection system, and to further modify the three dimensional inspection system to use the feature coordinate data to generate inspection control data. The Examiner's construction of claim 1 as being anticipated by Michael in view of Nichani reads elements out of the claim, in violation of the legal

requirements for claim construction imposed by the Federal Circuit, and should be reversed.

Claim 2 depends from claim 1 and further includes "a component inspection controller coupled to the three dimensional inspection system, the component inspection controller receiving the inspection control data and controlling the location of the component based upon the inspection control data." The Examiner construes these elements as being that which is disclosed by Michael. Again, Michael only discloses a robotic manipulator arm 22 that retrieves an inspection device 20 from a known location on a surface 25 and places the inspection device 20 in a predetermined location relative to image acquisition device 24, and entirely fails to disclose "controlling the location of the component based upon the inspection control data" that is generated from feature coordinate data. The Examiner's construction of claim 2 reads elements out of the claim and therefore should be reversed.

Claim 3 depends from claim 1 and further includes "a reference image system storing one or more reference images; a test image system storing test image data; and a comparator system coupled to the reference image system and the test image system, the comparator system generating difference data from the reference image data and the test image data." Applicants submit that the elements added by this dependent claim are more properly characterized as being similar to a golden template comparison system, except that the claimed elements are being used to provide difference data, such as for use by the two dimensional inspection system or the three dimensional inspection system, and are not the entire inspection process as disclosed by Nichani. As the Examiner's construction of claim 3 as being the golden template comparison inspection process disclosed by Michael in view of Nichani reads these elements out of the claim, it is improper and should be reversed.

Claim 4 depends from claim 3 and includes that the reference image system comprises a die base reference image system storing image data of a die prior to installation of bumps. The Examiner admits that "Nichani does not explicitly state whether the reference image may be generated from a workpiece which is not to be tested," but goes on to assert that "it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece *before* soldering, and then compare the image *after* the bumps were installed." Paper no. 6, page 4 (emphasis in original). While "common sense" might suffice as a motivation to combine prior art references, in order to provide a basis for rejection under 35 U.S.C. 103, the combination of the prior art references

must still teach or suggest ***all the claim limitations***. In the present case, absent the applicant's disclosure, there would be no teaching or suggestion in Michael or Nichani to provide the elements of claim 4. These elements are not only entirely missing from the cited art, the Examiner uses the claims as a blueprint to assert that adding the missing elements to the cited art would be obvious! The fact stands that neither the system of Nichani, Michael, nor of Michael in view of Nichani would infringe claim 4 – nowhere is it disclosed in either Michael or Nichani that image data of a die prior to installation of bumps is stored, much less compared to image data of the die after the installation of bumps to generate location data identifying the location of the bumps. The Examiner's construction of claim 4 as covering Michael in view of Nichani reads elements out of the claim in violation of the of the legal requirements for claim construction imposed by the Federal Circuit, and should be reversed. Furthermore, using difference data generated from image data of a component prior to the installation of features and image data of the component after the installation of features to generate location data of the features is in inherent in claims 4, 10 and 16 through 21, for which reason these claims stand or fall separately.

Claim 5 depends from claim 3 and includes that the reference image system comprises a test die reference image system storing image data of a test die with installed bumps. Again, the Examiner relies on "common sense" to provide an element of the claims that would then have to be read out of the claims in order to find infringement of claim 5 by a system that combined Michael and Nichani. The Examiner's construction of claim 5 as covering Michael in view of Nichani reads elements out of the claim in violation of the of the legal requirements for claim construction imposed by the Federal Circuit, and should be reversed.

Claim 6 depends from claim 1 and provides that the two dimensional inspection system further comprises a feature location tracking system storing the feature location data and providing the feature location data to the three dimensional inspection system after all features of the component are located. The Examiner construes this element to be that disclosed by Nichani at column 2, line 11, which states "GTC is a technique for locating objects by comparing a feature under scrutiny (to wit, a lead frame) to a good image – or golden template- that is stored in memory. The technique subtracts the good image from the test image and analyzes the differences to determine if the expected object (e.g., a defect) is present." First, it is observed that nothing in the cited section of Nichani refers to generating feature location data. "Feature"

as used in Nichani is equivalent to "component" as used in claim 6, in which a component can have one or more features. It is axiomatic that the applicants can be their own lexicographer, and merely because Nichani refers to a component that is being inspected as a "feature under scrutiny (to wit, a lead frame)" does not control the meaning of the term "feature" as used by Applicants, in which a component under inspection can have one or more features. Second, it is further observed that Nichani disclosure ***teaches away*** from the Examiner's assertion that golden template comparison makes it obvious to compare an image of a die before installation of bumps with an image of a die after installation of bumps to locate the position of the bumps - if the purpose of golden template comparison is to detect ***defects***, then comparing the image before installation of bumps to the image after installation of bumps would result in the identification of all of the bumps as defects, or obscure the identity of any defects! Furthermore, Nichani discloses that after the defects are located by performing golden template comparison, there would be no need to generate feature coordinate data to perform an additional three dimensional inspection, because the defects are analyzed by connectivity analysis "to determine whether the defect necessitates rejection of the lead frame." The Examiner's construction of claim 6 as covering Michael in view of Nichani reads limitations out of the claim, and should be reversed.

Claim 7 depends from claim 1 and provides that the three dimensional inspection system further comprises a laser placement system that determines the location of a laser inspection track on the component from the feature location data. The Examiner construes this element as being that disclosed by Michael on the basis that "the disclosure in Michael is broad enough to include alternative illumination sources." However, this element requires more than just an "alternative illumination source" - Michael fails to disclose a ***placement system*** that determines the ***location*** of any kind of ***three dimensional measurement device*** on the component from the feature location data, much less the location of a laser inspection track. As previously discussed, Michael discloses scanning an entire component with a laser inspection track or any other three dimensional data generating process, which is time consuming and significantly slows the inspection process. By determining the locations requiring three dimensional inspection from two dimensional inspection data, the inspection process can proceed much faster. The Examiner's construction of claim 7 as covering Michael in view of Nichani again reads out limitations of the claim, and should be reversed.

Claim 8 depends from claim 1 and provides that the three dimensional inspection system

further comprises a three dimensional image data analysis system that receives laser image data and determines three dimensional feature location data from the laser image data. The Examiner again construes this element as being only the use of a laser to perform a three dimensional inspection of the entire component (see paper 4, page 7) but a proper construction of the element includes a ***three dimensional image data analysis system*** that receives laser image data and determines ***three dimensional feature location data*** from the laser image data. The Examiner's construction of the claim as covering Michael in view of Nichani reads these elements out of the claim, and should be reversed.

Claim 9 includes a "method for inspecting a component comprising: processing two dimensional image data of the component to determine location data for each of a plurality of features on the component; determining control data for a three dimensional inspection of the component from the location data for each of the plurality of features; and performing a three dimensional inspection of the component using the control data." As previously discussed, the construction of this claim put forward by the Examiner reads elements out of the claim. Michael generates three dimensional data of the entire inspection object, and compares it to a three dimensional model that is "generally similar in shape to the objects of interest 21 to be located in the 3D captured image data." Col. 5, lines 6-7. The three dimensional captured image data is generated by scanning the entire object. "The image acquisition device 24 images the surface of the inspection device 20 and produces 3D image data, which is distinct from 2D grey scale image data." Michael, col. 4, lines 40-42. In contrast, claim 9 includes determining control data for a three dimensional inspection of the component from the location data generated by a two dimensional inspection, and performing a three dimensional inspection of the component using the control data. The Examiner's construction of the claim as covering Michael in view of Nichani reads these elements out of the claim, and should be reversed.

Claim 10 depends from claim 9 and provides that processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises: comparing test image data to die base reference image data to generate difference data; and analyzing the difference data to determine the location of each of the plurality of features." Again, neither Michael nor Nichani disclose this process – using "before" and "after" images to locate features, and then using the feature location data to generate control data for the three dimensional inspection, such as to decrease the time required to perform such

inspections. The Examiner's construction of claim 10 as covering Michael in view of Nichani reads limitations out of the claims, and should be reversed.

Claim 11 depends from claim 9 and provides that processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises: comparing test image data to test die reference image data to generate difference data; and analyzing the difference data to determine the location of each of the plurality of features. Again, the Examiner's construction of claim 11 as covering Michael in view of Nichani reads limitations out of the claim, because neither Michael nor Nichani use difference data to determine feature location data that is used to control the inspection, and should be reversed.

Claim 12 depends from claim 9 and provides that determining the control data for the three dimensional inspection of the component from the location data for each of the plurality of features comprises determining placement sequence data for a laser inspection track such that the laser inspection track is placed on each of the plurality of features at least once; and determining component movement control data from the placement sequence data." The Examiner's construction of claim 12 glosses over the claim elements added by claim 12 – "determining placement sequence data for a laser inspection track such that the laser inspection track is placed on each of the plurality of features at least once; and determining component movement control data from the placement sequence data" is simply not suggested or taught from the disclosure in Michael that the three dimensional inspection portion of the system may be adapted to recognize "image data from radar, sonar, or other depth measuring devices." Both Michael and Nichani disclose systems that generate image data of the entire component, and completely fail to teach or suggest that two dimensional data can be used to determine the location of a laser track on a component having a plurality of features, much less that a placement sequence for the laser track can be determined so that the laser track is placed on each of the plurality of features at least once. The Examiner's construction of claim 12 as covering Michael in view of Nichani reads limitations out of the claim and is improper.

Claim 13 depends from claim 9 and provides that performing the three dimensional inspection of the component using the control data comprises obtaining image data from a laser inspection track on the component and analyzing the image data to determine the location of one or more features. The Examiner again construes these elements as being that which is disclosed

by the broad disclosure in Michael that that the three dimensional inspection portion of the system may be adapted to recognize "image data from radar, sonar, or other depth measuring devices." This construction reads elements out of the claim, because Michael generates three dimensional image data of the entire component and does not limit the generation of the generation of three dimensional image data to areas where there are one or more features. As the Examiner's construction of claim 13 as covering Michael in view of Nichani reads out elements in violation of Federal Circuit law, it should be reversed.

Claims 14 and 15 depend from claim 13 and include moving the component until the image data has been obtained for each of the features on the component, and generating error data if the location of any of the one or more features is outside of a predetermined location range, respectively. In both Michael and Nichani, the component is held stationary while image data is generated of the entire component. In fact, Nichani discloses at col. 6, lines 34-43, that it may be necessary to register the images of the entire component if the lead frame or camera is moved, which teaches away from intentionally moving the component until image data is obtained for each of the features on the component. As neither Michael nor Nichani teach or suggest moving the component during the generation of image data in order to obtain image data for each of the features of the component, much less generating error data if the location of any of the features is outside of a predetermined location ***range***, the Examiner's construction of these claims as covering what is disclosed by Michael in view of Nichani reads limitations out of the claims and should be reversed.

Claim 19 depends from claim 16, discussed below, and includes determining the placement of a three dimensional inspection component based upon the location of each of the one or more features. The Examiner's construction of this claim, as being that disclosed by Michael in view of Nichani, improperly reads this limitation out of the claim, because the three dimensional inspection data of Michael is generated for the entire component, and the location of features is then determined by comparing the captured image data to a synthetic model. As previously discussed, by selectively placing a three dimensional inspection component based upon the location of each of the one or more features, the inspection time can be significantly reduced because three dimensional image data does not need to be generated for the entire component. As such, the Examiner's construction of the claim is improper and should be reversed.

Claim 20 depends from claim 19 and provides that determining the placement of the three dimensional inspection component comprises determining the location of a laser track. Again, the Examiner construes this as being identical to Michael's brute-force method of generating three dimensional captured image data of the entire component and then comparing this to a predefined synthetic model. This construction is incorrect as it reads limitations out of the claim, and should be reversed.

5. Patentability of claims 16 through 18 and 21

As previously discussed, Nichani discloses golden template comparison, which uses the difference in a golden template of a component and the image of a component under test to locate defects. One of the drawbacks with this process noted by Nichani is the need for registration. The invention of Nichani eliminates that drawback by generating first image data of a component under a first lighting condition and second image data of the component under a second lighting condition, both of which are selected so that the difference image of the first image data and the second image data will make detection of defects easier. In either golden template comparison or the invention of Nichani, the processes result in the obscuring of features of the component, so as to make the detection of defects easier.

Claim 16 provides a method for processing image data to locate one or more features comprising receiving first image data of a component prior to installation of one or more features, receiving second image data of the component after the installation of the one or more features, comparing the first image data and the second image data to generate difference data, and determining the location of each of the one or more features from the difference data. The Examiner construes claim 16 as being that which is disclosed by Nichani, again stating that "it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece before soldering, and then compare the image subsequently." However, the system disclosed by Nichani simply does not infringe claim 16 – it does not disclose receiving first image data of a component prior to installation of one or more features, receiving second image data of the component after the installation of the one or more features, comparing the first image data and the second image data to generate difference data, and determining the location of each of the one or more features from the difference data. The Examiner's construction of the claim reads every single element

out of the claim, using the claim as a blueprint for the assertion that it is obvious to practice the claimed invention! As previously discussed, Nichani teaches away from claim 16, as it states that golden template comparison is used to determine if ***defects*** are present (such that nothing would be detected on a non-defective component), and further, Nichani fails to state that golden template comparison can be used to provide any ***feature location data*** (such that if nothing were detected, then the component would be defective). Golden template comparison is a pass/fail test – if a defect is present, then the component is rejected. Finally, the process of claim 16 is not performed to locate defects, but to locate features that are installed on the component. Golden template comparison causes the features to be obscured, not identified – the purpose of golden template comparison (as well as the invention of Nichani) is to cause the known features to disappear in the difference image, leaving only the unexpected defects. The Examiner's construction of claim 16 as covering that which is disclosed by Nichani glosses over all of the limitations of the claim, and is therefore improper under binding Federal Circuit precedent.

Claim 17 depends from claim 16 and provides that receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a die prior to the installation of one or more contact bumps. Again, this makes clears that the features are not defects, but are instead designed to be present on the component. The Examiner construes this claim to cover the defect detection process of Nichani, but it would not be possible to detect defects using this process as they would be mistaken for contact bumps! This exemplifies the problems with the Examiner's construction of this claim, which improperly reads elements out and should therefore be reversed.

Claim 18 depends from claim 16 and provides that receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a representative component prior to the installation of the one or more features. Again, Nichani fails to disclose this process, and the Examiner's construction of claim 18 as being that which is disclosed by Nichani reads elements out of the claim and should be reversed.

Claim 21 depends from claim 16 and provides that determining the location of each of the one or more features from the difference data comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features. Using this process, it would be possible to detect the

location of a feature when the brightness data on one side of the feature "blends in" to the background of the reference image, as long as there is an edge of the feature that can be distinguished. Again, this element is completely absent from Nichani, which would ignore areas where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image, either using the invention of Nichani or golden template comparison. The Examiner's construction reads limitations out of the claim, is improper, and should be reversed.

6. <u>Summary</u>

For the reasons set forth above, Appellant submits that the Examiner's construction of the claims is improper on the grounds that it reads elements out of the claims, and that Appellant's properly construed claimed invention is indeed novel and unobvious over the applied references and the art of record.

Accordingly, the Examiner's rejections must be <u>REVERSED</u>, and claims 1-21 must be allowed.

IX. APPENDIX OF CLAIMS (37 C.F.R. § 1.192(c)(9))

The text of the claims involved in the appeal are as follows:

1. A system for inspecting a component comprising:

a two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data; and

a three dimensional inspection system coupled to the two dimensional inspection system, the three dimensional inspection system receiving the feature coordinate data and generating inspection control data.

2. The system of claim 1 further comprising a component inspection controller coupled to the three dimensional inspection system, the component inspection controller receiving the inspection control data and controlling the location of the component based upon the inspection control data.

3. The system of claim 1 further comprising:

a reference image system storing one or more reference images;

a test image system storing test image data; and

a comparator system coupled to the reference image system and the test image system, the comparator system generating difference data from the reference image data and the test image data.

4. The system of claim 3 wherein the reference image system comprises a die base reference image system storing image data of a die prior to installation of bumps.

5. The system of claim 3 wherein the reference image system comprises a test die reference image system storing image data of a test die with installed bumps.

6. The system of claim 1 wherein the two dimensional inspection system further comprises a feature location tracking system storing the feature location data and providing the feature location data to the three dimensional inspection system after all features of the component are located.

7. The system of claim 1 wherein the three dimensional inspection system further comprises a laser placement system that determines the location of a laser inspection track on the component from the feature location data.

8. The system of claim 1 wherein the three dimensional inspection system further comprises a three dimensional image data analysis system that receives laser image data and determines three dimensional feature location data from the laser image data.

9. A method for inspecting a component comprising:

processing two dimensional image data of the component to determine location data for each of a plurality of features on the component;

determining control data for a three dimensional inspection of the component from the location data for each of the plurality of features; and

performing a three dimensional inspection of the component using the control data.

10. The method of claim 9 wherein processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises:

comparing test image data to die base reference image data to generate difference data; and

analyzing the difference data to determine the location of each of the plurality of features.

11. The method of claim 9 wherein processing the two dimensional image data of the component to determine the location data for each of the plurality of features on the component comprises:

comparing test image data to test die reference image data to generate difference data; and

analyzing the difference data to determine the location of each of the plurality of features.

12. The method of claim 9 wherein determining the control data for the three

dimensional inspection of the component from the location data for each of the plurality of features comprises:

determining placement sequence data for a laser inspection track such that the laser inspection track is placed on each of the plurality of features at least once; and

determining component movement control data from the placement sequence data.

13. The method of claim 9 wherein performing the three dimensional inspection of the component using the control data comprises:

obtaining image data from a laser inspection track on the component; and

analyzing the image data to determine the location of one or more features.

14. The method of claim 13 further comprising moving the component until the image data has been obtained for each of the features on the component.

15. The method of claim 13 further comprising generating error data if the location of any of the one or more features is outside of a predetermined location range.

16. A method for processing image data to locate one or more features comprising:

receiving first image data of a component prior to installation of one or more features;

receiving second image data of the component after the installation of the one or more features;

comparing the first image data and the second image data to generate difference data; and

determining the location of each of the one or more features from the difference data.

17. The method of claim 16 wherein receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a die prior to the installation of one or more contact bumps.

18. The method of claim 16 wherein receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a representative component prior to the installation of the one or more features.

19. The method of claim 16 further comprising determining the placement of a three-dimensional inspection component based upon the location of each of the one or more features.

20. The method of claim 19 wherein determining the placement of the three-dimensional inspection component comprises determining the location of a laser track.

21. The method of claim 16 wherein determining the location of each of the one or more features from the difference data comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features.

X. OTHER MATERIAL THAT APPELLANT CONSIDERS NECESSARY OR DESIRABLE

See Appendix:

A. Michael - U.S. Patent No. 6,173,070
B. Nichani - U.S. Patent No. 6,298,149

Respectfully submitted,

7/25/03 By: ______________________

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